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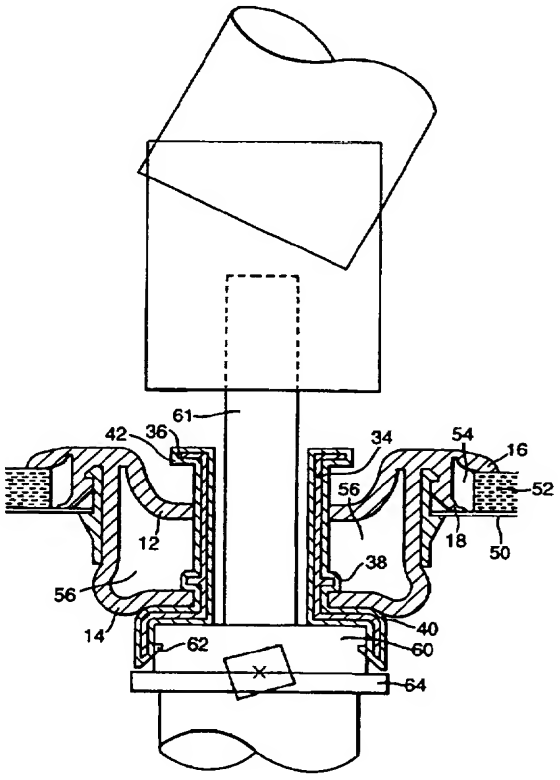
(54) Abstract Title
Steering column seal

(57) A steering column gasket for sealing a steering column to an aperture in a vehicle bulkhead (50), comprising a substantially rigid collar (32) arranged to encompass and sealingly to engage a non-rotatable part (60) of the steering column and a flexible sealing member (10) arranged sealingly to engage the collar (32) and the bulkhead (50) adjacent the aperture thereby to bridge the gap between the edge of the aperture and the collar (32).

Fig.2.



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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

Fig.1a.

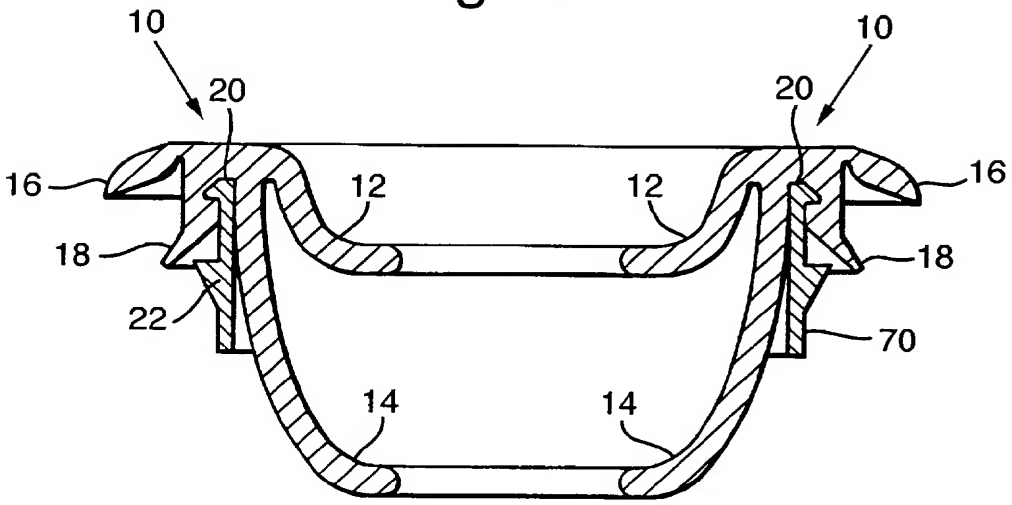


Fig.1b.

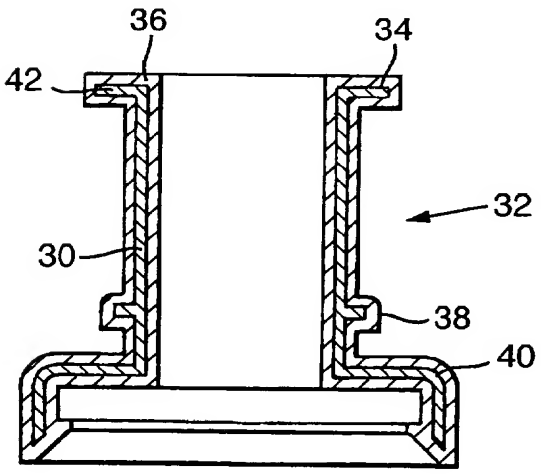


Fig.2.

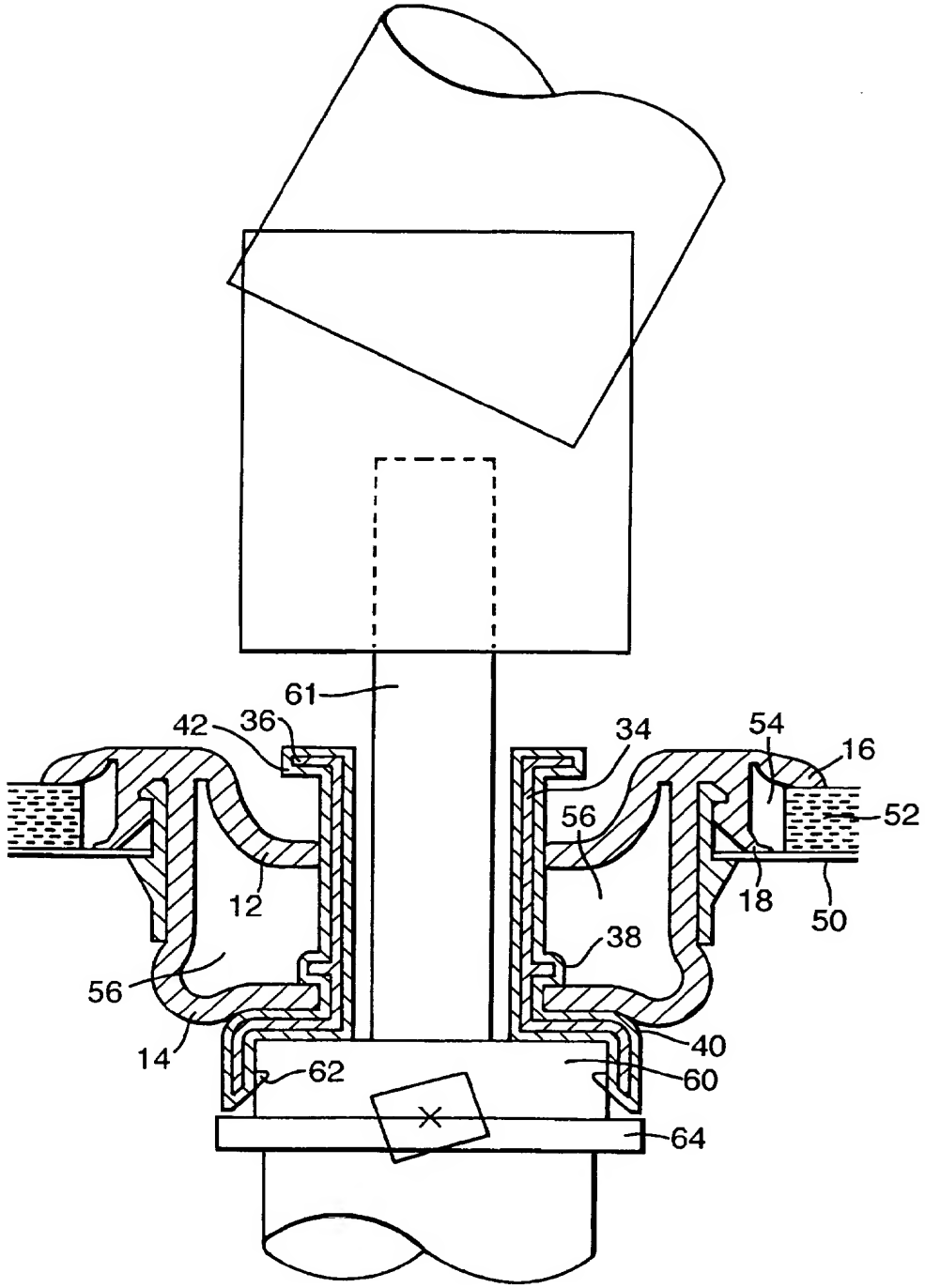


Fig.3.

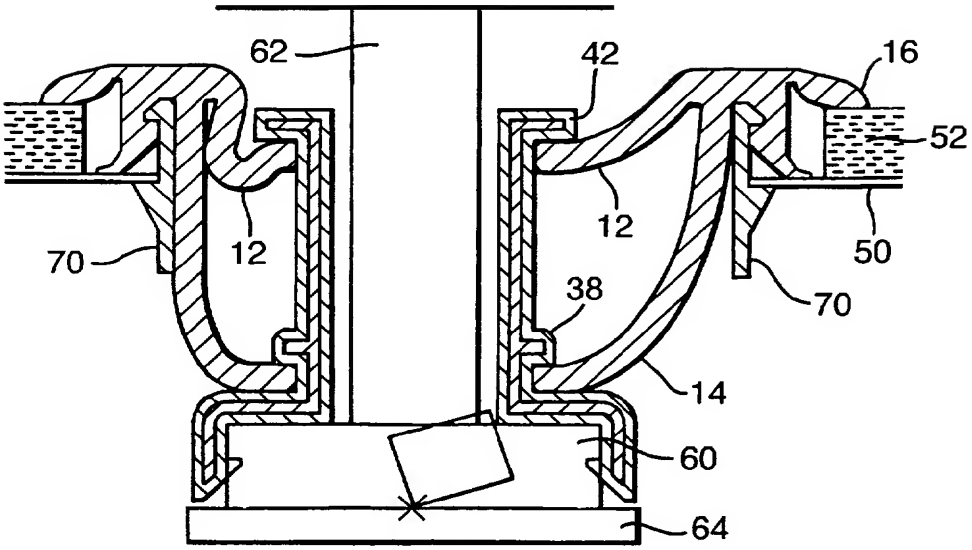
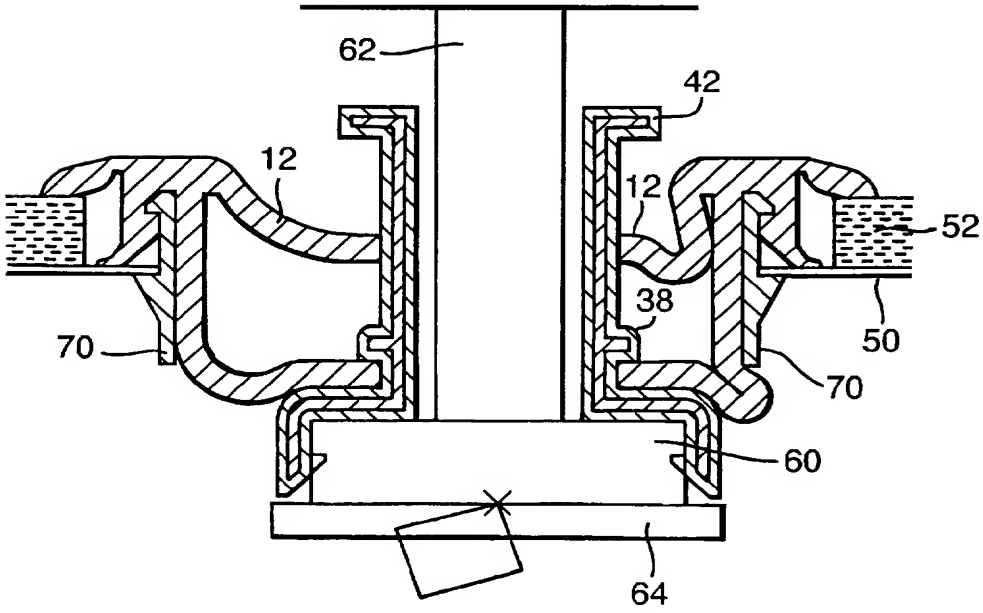


Fig.4.



GASKETS

This invention relates to a gasket and in particular to a gasket for sealing a steering column to an aperture in a vehicle bulkhead.

Increasing demands are being placed on this type of gasket. In particular, it is desirable that the gasket provides a level of acoustic isolation between the passenger and engine compartments of a vehicle so that sounds from outside the vehicle or from the engine compartment do not enter the passenger compartment. Also, since the position of a vehicle steering wheel is now frequently adjustable, there is a need to accommodate lateral as well as rotational movement of the steering column as it passes through the vehicle bulkhead. Additionally, it is desirable that the gasket not only provide acoustic isolation but good sealing against water, dirt, fumes and other agents which may be present outside the passenger compartment. Furthermore, it is desirable that the gasket allow easy rotation of the steering column without excessive rubbing.

According to a first aspect of the invention, there is provided a steering column gasket for sealing a steering column to an aperture in a vehicle bulkhead, comprising a substantially rigid

collar arranged to encompass and sealingly to engage a non-rotatable part of the steering column and a flexible sealing member arranged sealingly to engage the collar and the bulkhead adjacent the aperture thereby to bridge the gap between the edge of the aperture and the collar.

In a further aspect, the invention provides a steering column including non-rotatable means forming a non-rotatable part of the column and arranged to cooperate with the said collar described immediately above.

According to another aspect of the invention, there is provided a steering column gasket for sealing a steering column to an aperture in a vehicle bulkhead, comprising a substantially rigid generally annular collar having a reduced diameter neck portion and an increased diameter engaging portion, the collar being arranged to permit the rotatable shaft of a steering column to pass generally through its centre and to engage a non-rotatable part of the steering column and a flexible sealing member arranged sealingly to engage the neck portion and sealingly to engage the bulkhead adjacent the aperture.

According to a method aspect of the invention, a method of

fitting a steering column gasket to a vehicle bulkhead comprises mounting a sealing member on a substantially rigid collar, passing the collar at least partially through an aperture in the bulkhead through which the steering column passes, fixing the collar to a non-rotatable part of the steering column and engaging the sealing member with the bulkhead.

Steering column gaskets embodying the invention will be described by way of example with reference to the drawings in which:-

Figure 1A is a schematic sectional view of a flexible sealing member;

Figure 1B is a schematic sectional view of a collar;

Figure 2 is a schematic sectional view of the sealing member of Figure 1A assembled to the collar of Figure 1B and mounted to a vehicle bulkhead;

Figure 3 is a schematic view similar to Figure 2 with the sealing member under compression; and

Figure 4 is a similar view to Figure 2 showing the sealing member

under maximum compression.

With reference to Figures 1A and 1B, a flexible (typically elastomeric) sealing member 10 has internal flaps 12 and 14 and external flaps 16 and 18. In plan view, the sealing member 10 is generally annular and the internal flaps 12 and 14 extend from the inner wall of the annulus generally towards the central axis of the annulus, and the external flaps 16 and 18 extend from the outside wall of the annulus generally away from the annulus.

A generally U-shaped annular channel 20 is formed between the two pairs of flaps 16 and 18 and 12 and 14 and houses the upper part of a rigid (typically plastics) clip 22. The clip 22 is preferably secured to the sealing member 10 by a heating process. The clip 22 engages a vehicle bulkhead as will be described below.

The internal flaps 12 and 14 are arranged to press against a stem portion 30 of a substantially rigid collar 32. The collar 32 typically is made from a rigid metal or plastics central core 34 overmoulded at least in part with a more resilient covering material 36. The covering 36 enhances the sealing properties of the collar 32 against the steering column as described in more

detail below and also its acoustic damping properties.

With reference to Figure 2, the flaps 12 and 14 engage the neck portion 30 at axially displaced positions delimited by a projection 38 near the lower end of the neck portion 30.

At the base of the neck portion 30, a larger diameter mounting portion 40 is formed. The lower internal flap 14 is held substantially axially immovable between the projection 38 and the upper surface of the mounting portion 40 as shown in Figure 2. However, the upper internal flap 12 is free to contact the neck portion 30 at any position between the projection 38 and an upper projection 42 formed at the top of the neck portion 30.

With particular reference to Figure 2, the clip 22 engages a vehicle bulkhead 50. The lower external flap 18 is held against the opposite side of the bulkhead 50 by the clip 22 and forms a seal against dirt, water and noise. The upper external flap 16 seals similarly against a layer of soundproofing material 52 applied to the bulkhead 50.

The external flaps 16 and 18, the bulkhead 50 and the soundproofing material 52 define a chamber 54 which provides

acoustic damping between the two sides of the bulkhead 50. Similarly, a chamber 56 defined between the two internal flaps 12 and 14 and the neck portion 30 of the mounting portion 32 also provides acoustic damping.

A generally annular collar 60 is mounted on a rotating shaft 61 of the steering column on bearings (typically needle roller bearings) so that it is free to remain stationary while the shaft 61 rotates.

The mounting portion 40 grips the collar 60 via conical projecting portions 62 formed from the resilient overmoulded covering 36. The conical projections 62 thus grip the collar 60 and provide a good seal against water penetration from the lower side of the bulkhead 50 (as shown in the Figure) to the upper side. The conical shape of the projections also aids insertion of the collar 60 into the mounting portion 40. An enlarged diameter portion 64 of the collar 60 prevents the mounting portion 40 from moving further than desired axially along the collar 60. The collar 60 may include a recess preferably in the form of a circumferential groove (not shown) for receiving the conical projections 62.

Figures 3 and 4 show the combination of the flexible sealing member 10 and rigid collar 32 under different compression conditions. In Figure 3, the steering column is offset to the left in relation to the aperture in the bulkhead 50 and the column is also axially displaced further through the aperture (downwardly in the Figure) than shown in Figures 2 or 4. This Figure illustrates that good sealing is still obtained under these conditions.

Similarly in Figure 4, the steering column is offset further to the right than in Figures 3 or 2 and is also displaced axially upwardly.

Thus the gasket described above is readily able to accommodate manufacturing tolerances which may cause the steering column not to be central in the bulkhead aperture. It is also readily able to accommodate relative movement between the steering column and the bulkhead which occurs as a result of adjustment of the steering wheel position. The chambers 56 and 54 provide good acoustic isolation between the two sides of the vehicle bulkhead 50. Furthermore, good sealing is maintained by the flaps 12, 14, 16 and 18 and also the generally conical projections 62.

By providing the collar 60 with bearings and allowing it to remain stationary while the shaft 61 rotates, the problem of friction and rubbing between a gasket and a steering column is avoided.

Furthermore, typically the engine compartment of a vehicle will be on the side of the vehicle bulkhead opposite that of the soundproofing 52, i.e. in the lower portion of Figures 2, 3 and 4. The arrangement of the gasket permits the gasket to be fitted to the vehicle entirely from within the passenger compartment. This is desirable since it is usually inconvenient to mount gaskets from within the engine compartment since access from this side may be difficult.

Typically, mounting is achieved by fitting the collar 60 to the steering column which is then fitted to the vehicle. Alternatively, the collar 60 may be slid along the steering column (before fitting of larger diameter items such as the steering wheel) after it has been fitted to the vehicle.

The sealing member 32 is then engaged with the neck portion 30 via flaps 12 and 14. The mounting portion 40 of the collar 32 may then be engaged with the collar 60 of the steering column.

Finally, the clip 22 is engaged with the vehicle bulkhead 50.

The lower portion 70 of the clip 22 serves to guide the lower internal flaps 14 to help to ensure that the flaps 14 remain located between the projection 38 and the upper surface of the mounting portion 40. However, it will be appreciated that the diameter of the clip 22 is relatively large (being only slightly smaller than the bulkhead aperture). Thus the internal flaps 12 and 14 can also be large which allows them to be flexible which in turn, enhances their acoustic performance. This is because increased flexibility of the flaps reduces the transmission of vibrations from the steering column to the vehicle bulkhead. The external flap 16 similarly is long enough to accommodate relative movement of the steering column and bulkhead 50 without significant transmission of vibrations.

CLAIMS

1. A steering column gasket for sealing a steering column to an aperture in a vehicle bulkhead, comprising a substantially rigid collar arranged to encompass and sealingly to engage a non-rotatable part of the steering column and a flexible sealing member arranged sealingly to engage the collar and the bulkhead adjacent the aperture thereby to bridge the gap between the edge of the aperture and the collar.

2. A gasket according to claim 1, wherein the sealing member has two flexible walls which engage the rigid collar at respective positions spaced apart in the direction of the axis of the steering column to define an air-filled chamber between the walls and the collar.

3. A gasket according to claim 1 or claim 2, wherein the sealing member includes a resilient bulkhead flap arranged to press against a first side of the bulkhead to form a seal between the flexible member and the bulkhead.

4. A gasket according to claim 4, wherein the sealing member

includes securing means arranged to engage the second side of the bulkhead and to hold the bulkhead flap against the first side of the bulkhead.

5. A gasket according to claim 4, wherein the sealing member includes a resilient second flap arranged to press against the free surface of a thickness of material, such as soundproofing material, applied to the first side of the bulkhead, the free surface of the material being displaced from the first side of the bulkhead generally along the axis of the steering column.

6. A steering column including non-rotatable means forming a non-rotatable part of the column and a gasket according to any preceding claim for sealing the column to an aperture in a vehicle bulkhead, the non-rotatable means of the column being arranged to cooperate with the said collar of any preceding claim.

7. A steering column according to claim 6, including a rotating shaft for transmitting rotational movement from a vehicle steering wheel to a vehicle steering rack and wherein the non-rotatable means comprises a generally

annular member through which the shaft passes, the generally annular member being fixed axially on the shaft and mounted on the shaft with bearing means which permit relative rotational movement between the shaft and the generally annular member.

8. A steering column according to claim 7, wherein the bearing means includes needle roller bearings mounted on the inside of the generally annular member.

9. A steering column according to claim 7 or claim 8, wherein the generally annular member includes a portion of increased outer diameter and a portion of reduced outer diameter, the reduced diameter portion being arranged substantially to be covered by the said rigid collar and the rigid collar being arranged to abut the increased diameter portion whereby the increased diameter portion limits the axial movement of the collar over the generally annular member.

10. A steering column gasket for sealing a steering column to an aperture in a vehicle bulkhead, comprising a substantially rigid generally annular collar having a

reduced diameter neck portion and an increased diameter engaging portion spaced axially therefrom, the collar being arranged to permit the rotatable shaft of a steering column to pass generally through its centre and being arranged to engage a non-rotatable part of the steering column, and a flexible sealing member arranged sealingly to engage the neck portion and sealingly to engage the bulkhead adjacent the aperture.

11. A steering column gasket according to claim 10, wherein the engaging portion of the collar is dimensioned to pass through the aperture in the vehicle bulkhead to engage the non-rotatable part of the steering column on the other side of the bulkhead and to locate the collar with its neck portion intersecting the plane of the bulkhead.

12. A gasket according to claim 10 or claim 11, wherein the sealing member has two flaps which extend around and generally towards the collar and which engage the neck portion at positions displaced in the direction of the axis of the steering column to define a generally coaxial chamber around the outside of a length of the neck portion.

13. A gasket according to any of claims 10 to 12, wherein the sealing member includes an outwardly directed projection arranged resiliently to flex inwardly towards the centre of the collar as the sealing member is pushed through the aperture from a first side of the bulkhead and to engage the bulkhead on its second side once it has passed through the aperture thereby to engage the sealing member with the bulkhead.

14. A gasket according to claim 13, wherein the sealing member further includes a third flap extending around and generally away from the collar and arranged to cooperate with the said projection to press against the first side of the bulkhead to form a seal against the bulkhead.

15. A gasket according to claim 14, wherein the sealing member further includes a fourth flap extending away from the collar generally parallel with the third flap and arranged to press against a surface parallel to but axially displaced from the first surface of the bulkhead.

16. A method of fitting a steering column gasket to a vehicle bulkhead, comprising the steps of mounting a sealing member

on a substantially rigid collar, passing the collar at least partially through an aperture in the bulkhead through which the steering column passes, fixing the collar to a non-rotatable part of the steering column and engaging the sealing member with the bulkhead.

17. A method according to claim 18, wherein the collar is passed through the bulkhead from the passenger compartment of the vehicle.

18. A gasket constructed and arranged as described herein with reference to the drawings.

19. A steering column constructed and arranged as described herein with reference to the drawings.

The Patent Office

INVESTOR IN PEOPLE

Application No: GB 9824673.9 **Examiner:** Tom Sutherland
Claims searched: 1 - 17 **Date of search:** 5 March 1999

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): F2B, B7H(HFC, HFF), B7B (BEXB), F2Y (YSH)

Int Cl (Ed.6): B62D 1/16, 1/18; B60R 13/08

Other: Online: WPI, EPODOC, PAJ

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
Y	EP 0329526 A	(PEUGEOT) See Fig. 4.	2
X, Y	US 4840386	(DAIMLER-BENZ) See the Figs.	X: 1 Y:2

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.